SRS Lead Tests

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94-1 R&D End of Year Technical Review

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Purpose of SRS Lead Tests - 3013 Outer Container

- Outer 3013 Container Lead Surveillance
  - Supports DOE-Complex
    - Ensure Pu containing packages are safe throughout their lifetime
    - Provide predictive capability for required response time
    - Provide input for validation of science based and NDE models
    - Outer 3013 packages on shelf to lead stockpile
  - 94-1 Funding

Background - 3013

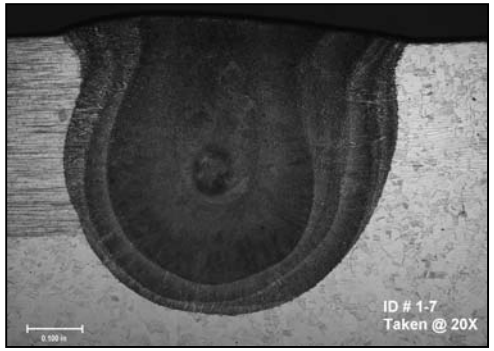
- Outer 3013 Container
  - Science based program through MIS
  - Draw from LANL basic corrosion information for test details
  - Long-term surveillance activities throughout storage period
  - Operational surveillance based on DOE 3013 Standard and Integrated Surveillance Program plan

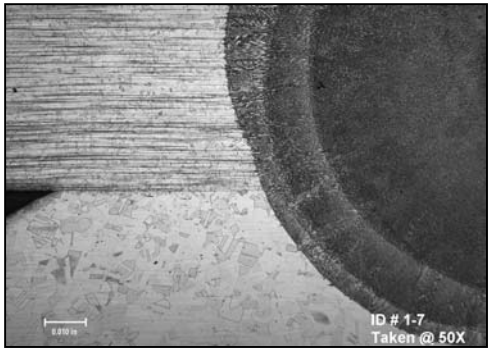
Program Elements - 3013

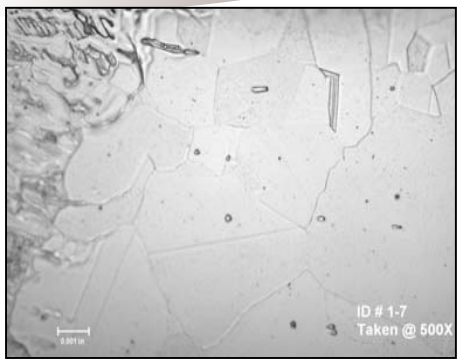
- Materials characterization - baseline testing
- Design & fabrication of lead surveillance packages
  - Determination of residual stresses
  - Fabrication techniques
- Establish experimental facility setup
- Selection of variables
- Evaluating surveillance containers
- Documentation of results

Baseline Characterization - GTAW Can

- No anomalies found

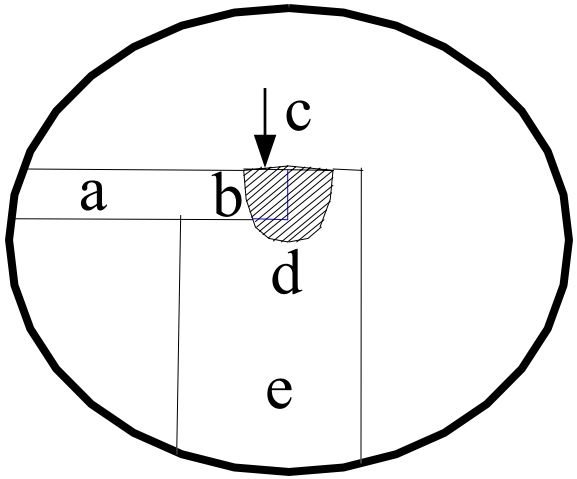






Knoop Hardness

a) Base 2 - 169.3
b) HAZ 2 - 176.6
c) Weld - 160.3
d) HAZ 1 - 166.1
e) Base 1 - 156.4



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Lead Surveillance Packages - Residual Stress Determination

- Boiling $MgCl_2$ Tests

GTAW Can

LBW Can

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Lead Surveillance Packages - Boiling $MgCl_2$ Tests Results

- As-fabricated can
- GTAW
- LBW

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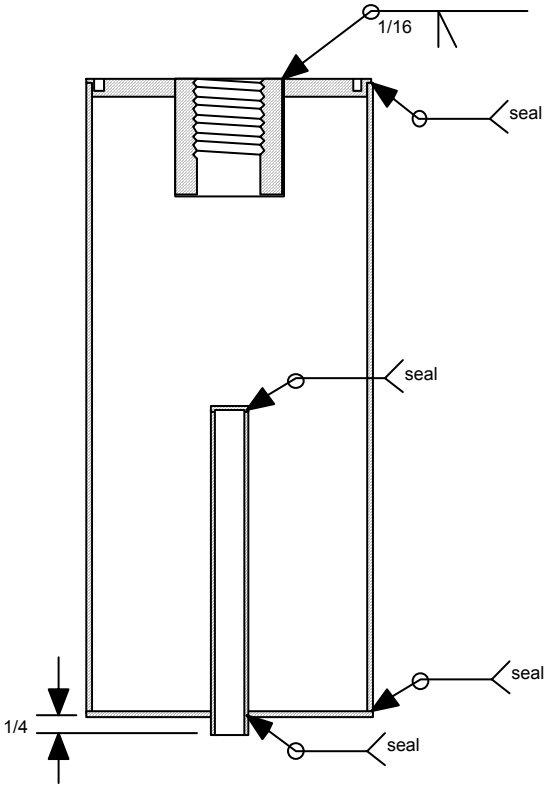
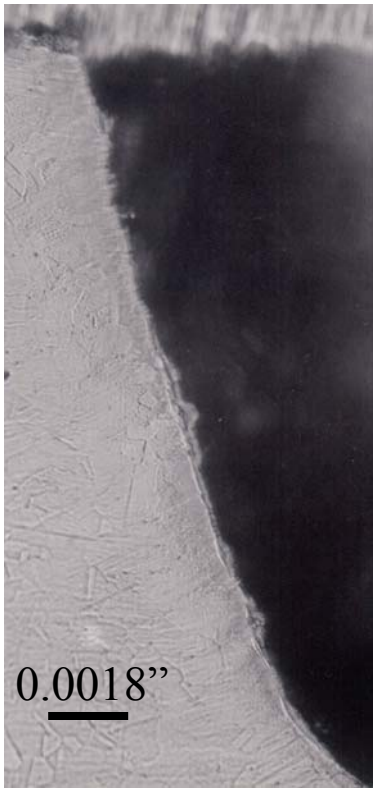
Lead Surveillance Packages - Fabrication Techniques

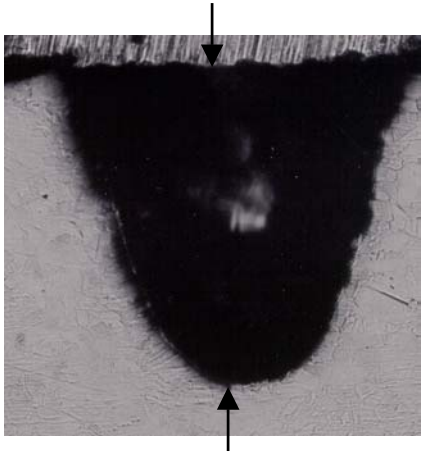
- Inner container design & fabrication

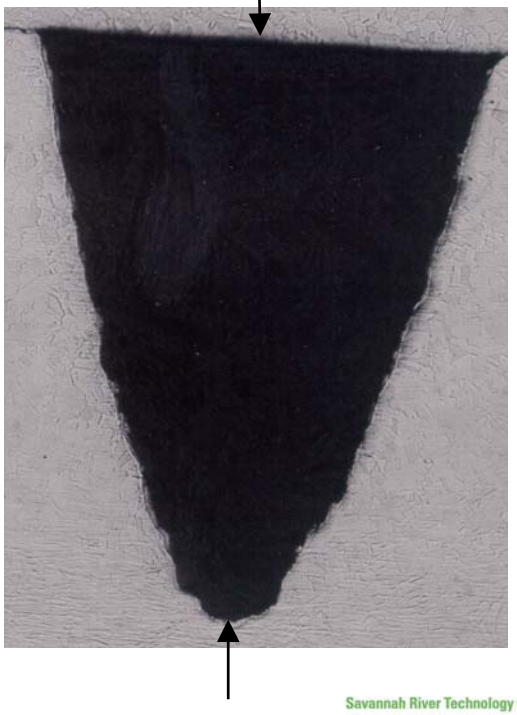


Lead Surveillance Packages - Simulated Flaws

- EDM technique provides pit formation







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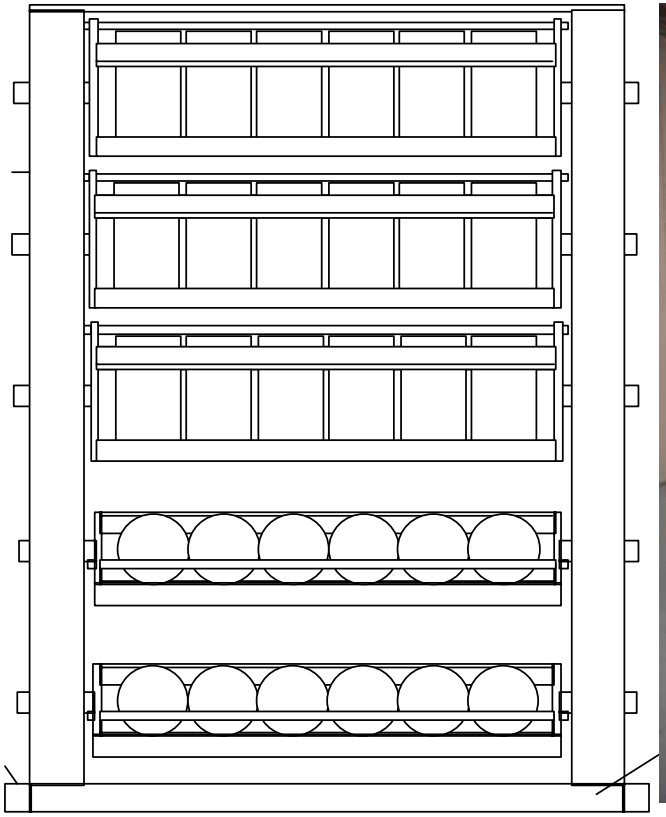
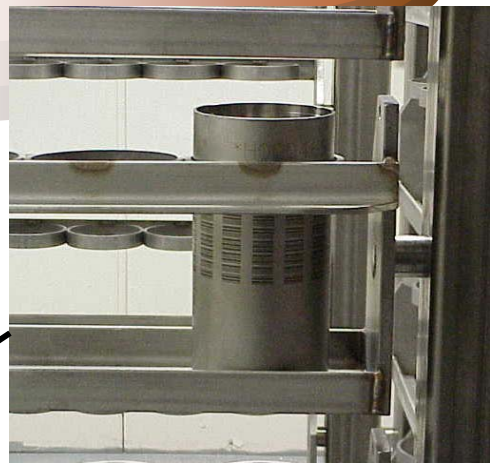
Lead Surveillance Packages

- Through wall crack being investigated
- Pursuing pit formation techniques
- Heaters purchased
- Temperature gradient tests with full and 1/2 full containers

Experimental Setup - Storage Rack





- Data Acquisition System nearly complete

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Selection of Variables

- Materials Moisture
  - Surrogate contents
  - Salt content
  - Metallurgical
- Environment
  - Temperature
  - Humidity
- Test matrix reviewed with MIS group
  - Initial matrix of 42 containers - space for 120

Evaluating Surveillance Packages

- Non-destructive (6 month frequency)
  - Provide baseline image of test packages
  - Validation/adaptation of technique
  - Radiography, digital radiography, ultrasonic testing, acoustic emission, piezo-electric sensors
- Destructive (5+ year frequency)

Documentation of Results

- Predictive model for determining which Pu-bearing 3013 containers are at the greatest risk for failure
  - Combination of LANL and SRS experimental work to develop this
  - (Empirically based - science supported)
- Integrating information with operations

Challenges

- Developing NDE techniques transferrable to operations
- Determining most appropriate chloride/fluoride & moisture contents, as well as materials processing parameters
- Obtaining outer containers
- Closure welding outer containers (particularly LBW)
- Integration with operations personnel